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ABSTRACT

The revolution in computers begun in the mid 1950's will help education to meet the new challenges of the future generated by the predicted drastic declines in student enrollment and by changes in the types of learners served. Projects such as PLATO and TICCIT have proved that computers can provide useful and timely instruction for such learners as the disadvantaged, part-time adults, the handicapped, and school dropouts, groups which will comprise a large segment of the educational population in the future. Computers can present instruction in developmental skills at a variety of levels, as well as more complex models of simulation, inquiry, and dialogue. While the games industry has led in this direction, teachers themselves are now not only learning to program and develop courseware, but are also initiating regional and national resource networks for sharing materials. The computer can also provide instruction for the handicapped through special input and output devices designed to increase their communication skills. Increased use of computers in the home, as well as for instructional purposes, will result in increased motivation for all learners, especially those young people who are potential high school dropouts. (BK)

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THE LEARNER AND THE COMPUTER

by

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THE LEARNER AND THE COMPUTER*

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Education is about to undergo a number of significant changes in the decades to come, and the size and scope of this national conference gives testimony to the importance of one of those areas of change: the computer revolution. While I recognize that my topic includes learning needs for both education and industry, my position as a college president provides a unique perspective on some of the key issues that will be faced in the coming years. I would like to take a few moments to share with you some of my perceptions, for I believe the ideas will help us understand our common problems and needs as educators.

Perhaps the most widely heralded change will be the drastic decline in enrollment forecast for the next twenty years, and that single factor will do more to alter the ways in which education and training is delivered than many other aspects combined. The list is lengthy and the issues are complex surrounding this important phenomenon, yet one cannot do justice to a discussion of the future without mention of this critical area.

Many of our colleges and universities will close during this period, and for those that remain, fewer students will mean fewer dollars, still higher tuitions, greater reliance on financial aid as a means to support institutional survival, and the relatively new intervention on the part of state and federal governments to control not only the distribution and use of allotted funds but the quality assurance and accreditation of our educational programs as well. The message has become clear that educational institutions must learn to manage themselves more effectively and efficiently, must increase their capacity to respond to changing curricular needs, must continually reach out to those populations not previously served by higher education, and above all, must hold themselves accountable for the quality of their educational process and product.

I do not wish to paint too difficult or bleak an outlook, but it is vital that we are aware of the realities of the times ahead. Education will continue to be radically affected by these realities, and the attitude toward them will have much to say about the quality of the effort we expend and the end results achieved. Beyond those challenges previously mentioned, I would like to add several others. These challenges encompass the following: seeking creative solutions and fostering innovation in a time of expediency; maintaining the hard won diversity in programming and student populations gained in the seventies; developing further instructional techniques and their application to learning styles; responding to the burgeoning field of high technology; and responding to the challenge to reintegrate the humanities into our vocationally oriented programs of study.

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From the mid 1950's when the computer was in its infancy, to the pioneer work with school children at Stanford University in the sixties and the developmental skills projects of PLATO and TICCIT in the seventies, a revolution has been in the making. Minnesota and Metropolitan State University have won national acclaim for their participation with PLATO, and as a matter of interest, when I was Vice President of Metro U, I developed and wrote the 1978 proposal for grant funds from Control Data to develop new alliances with technology by utilizing the PLATO system with adult learners. By and large, however, the educational community has ignored this important development in computers and only recently has begun to feel the effects of their neglect. The rush is on to purchase microcomputers and to develop courseware for education and training that can rival the best of the competitive commercial games. What once began as a revolution for the industrial world has now proclaimed loudly and clearly that the eighties will be a time of unprecedented growth and experimentation. The major problems of the past, that of cost, reliability, flexibility in size and use, and lack of courseware, are concerns being addressed rapidly. From the naive and overly optimistic industry of only several years ago, a more realistic if not less chaotic approach is now taking place with the development of materials for college level programming and the growth of a body of trained educators to expand upon the sophistication of today's computer capability. Initial studies such as those conducted at Kennedy King College in Chicago with student users, PLATO, TICCIT, and other early programs find much promise in learner reactions and attitudes, showing computers to be at least as effective as other supplemental forms of education. A great deal more needs to be understood, however, and further studies must discover ways to confirm not only the validity of these early trends but ways to discern which subject matter is being retained and how it can best occur at further levels of complexity.

We have spent time today examining the emerging pictures of an uncertain and troubled time for education and training and the contrasting bright and promising future for computers. One element remains as a silent constant throughout, and that element is the learner. I would now like to look at the learner, of what we know about his/her education and training needs, characteristics, and future potential for learning with computer assisted instruction.

Who will be the students of tomorrow? It is difficult at best to make projections, but there are some figures for higher education compiled by the Carnegie Commission and they are now forecasting the following characteristics of learner populations by the year 2000: the percentage of women will continue to rise from thirty-seven to fifty-two per cent; minority enrollments will take a huge leap from four to twenty-five per cent with a large number of Hispanics contributing to the total; the figures of part-time learners and adults will continue to rise, thirty to forty-five per cent to thirty to fifty per cent respectively; and the numbers of two year and commuter learners are also expected to increase. What these figures mean is that not only can we expect record numbers of minorities, but that we can also expect a continuation in enrollment of those learners higher education sought and attracted during the seventies.

The category of the disadvantaged or underprepared learner underlies and is part of all of the preceding groups, and it is the needs of this group I would like to focus upon first since it has so far been the target population of computer assisted instruction and in the future will continue to demand a heavy emphasis. Their same needs though, often transend type altogether and also apply to the other groups I will discuss.

What we do know about many underprepared learners are the following: that they lack the necessary basic conceptual and computation skills; that previous learning has been ineffective and consequently has provoked a fearful, low-risk taking, and self-protective stance; that there is a language barrier to be overcome; that there is a dependence on authority in learning situations; that judgment and objectivity are not well developed; and that past failure has promoted a passive and negative approach toward learning.

It is easy to see in this situation why projects such as PLATO and TICCIT have received such widespread attention and seemingly answered so many pressing needs, particularly in higher education. By focusing attention on the well developed and elementary modes of computer assisted instruction such as the tutorial, drill and practice, and elementary problem solving skills, it rapidly became apparent that this supplement could provide a useful and timely instructional solution to many of the previously mentioned learning needs. Not only are learners finding the instruction beneficial and less threatening, but teachers and trainers attest to the value of its diagnostic capabilities and monitoring functions. Learners also value the self-paced and individualized nature of this instruction since many past learning problems are directly rooted in the fears associated with failure and competition, and computer assisted instruction is one method of overcoming these previous barriers. In short, the potential worth is great in the area of developmental skills for a specific set of identifiable learning skills.

Disadvantaged or underprepared learners will comprise one large segment for the future, yet the last decade has also witnessed the growth of a sizeable proportion of adults and part-timers who will continue to bring a variety of needs to our educational and training environments. It is with adults that computer instruction can go beyond its past focus on elementary learning and can branch out to include the more complex computer modes of simulation, inquiry, and dialogue. These methodologies are presently in early developmental stages, yet already the potentials for experiential and experimented learning are becoming evident as systems are designed where the computer can respond orally, where music and drawing can be created, and where stimulation of societies is available.

I am hesitant to make the distinction that elementary modes will serve the underprepared and that other adults will benefit from the "higher" stages because such a distinction implies that methods are not applicable beyond a certain type of learner. For the purposes of the discussion, however, I would like to point to the further stages of cognitive development and possibilities for linkages with the more advanced computer modes.

Educational courseware is only beginning to be developed to answer some of the more complicated and sophisticated needs of our adults, and for the most part it is the games industry which has provided the leadership and innovation with advanced games such as "Three Mile Island" and "Hammurabi". Teachers have taught themselves to program, developed their own courseware, and have begun establishing regional and national resource networks for sharing and distribution of materials. A May, 1980 study by one such group, the Technical Education Research Center (TERC), shows the speed with which computers are being purchased and establishing themselves in schools and homes throughout the northeast region of this country. Radio Shack has marketed 200,000 TRS 80 Systems nationally this year, Sinclair has marketed many ZX 80 Systems, and by this winter, Pana-

sonic, Quasar, Commodore, Newbury Laboratories, and Sharp will begin selling small computers. But the traditional content fields of higher education are still quite barren despite the growth of the computer industry as a whole. Some programming is available in subjects such as Engineering, Accounting, Math, Statistics, and the developmental skills areas mentioned earlier, but by and large the higher educational component is an untapped area. If present developments continue, and by all estimates they will, the future holds great promise for the learner and the teacher with every important contribution of courseware to the traditional post-secondary curriuclum, continued miniaturization, reduction in cost of microcomputers, the further expansion of resource centers, and the learning of networking which are occuring among instructors of all levels. Industry, too, has yet to benefit from similar programming to cover training needs such as management, supervision, financial accounting and the like.

What then is the challenge with respect to the adult learner? One of the most important discoveries about adult development over the last twenty years has been the potential to facilitate growth and individual responsibility for a lerrner's intellectual, moral, and ethical development according to varying needs at different life stages. And in the years to come, because of the rapidity of change in our society, the valuable tool of "learning to learn" will take on additional value as learners become more autonomous and skilled in self-direction. It is at this point that we can discuss the computer as its individualized nature provides a natural setting for some of these needs. It also goes without saying that the computer is only a tool in this situation and a supplement like many other learning resources. However, the field is virtually wide open for educators to discover avenues to facilitate complex cognitive skills and to make explicit those skills now demanded of those who "just play games". This can involve a subtle intertwining of content and process to foster such competence as the ability to recognize patterns and relationships, the ability to conceptualize increasingly difficult material, to integrate disparate elements of knowledge, make judgments, and solve and evaluate complex problems. Likewise, the potential is great for extending those skills beyond the immediate theoretical realm and into the experiential and human world or awareness, values, and interpersonal relations. The computer, in other words, can become a microcosm of a larger reality, and the challenge will be to design and innovate college level and training programs to accomodate the larger world in which we live.

The third group of learners I wish to consider is that of the handicapped, and although the numbers of these learners will not be substantial in relation to the other categories, the frontier to solving many unique problems is continually expanding. Chief among those is the design of special input and output techniques which can become a voice for those who have none and eyes for those who are blind. By eliminating the use of cumbersome and oftentimes unusable keyboards and replacing them with a joy-stick maneuverable control, many are now able to write in ways previously impossible. Some developers are also working on systems which will include an audible feedback for the blind and one which will respond when only voice commands the computer. Further, with the development and use of personal computers for these very specialized needs, the memory component is able to provide an expanding learning center for the handicapped learner and greatly increase his/her ability to communicate with the world.

The fourth and final category of learners is that of youth, and although the number of youth is expected to decline in the coming two decades, studies such as that conducted by the Carnegie Commission indicate a very real problem which "is not going to disappear". Dropout rates from high schools continue at an alarming rate with twenty-three per cent overall, and an estimated twenty per cent of those who do graduate do so with deficiencies in language and numerical skills. Unemployment data show nearly fifty per cent accounting for the age category of twenty-four and younger. What these figures demonstrate are future needs for both the learner and society not unlike those discussed earlier for the underprepared. We would be mistaken, however, were we to assume that these potential learners comprise the majority, yet the underlying problems associated with lack of motivation are apparent for many learners, youth or otherwise. The computer revolution which has been in the making will increasingly attract the youth of today and tomorrow as personal microcomputers enter the home and increase in usage on the elementary and secondary levels in our schools. It is difficult to predict the actual outcome of this influx, but it is possible to make several assumptions based upon the present enthusiasm with which computer assisted instruction is being received by learners everywhere. Young people are being turned on in record numbers, they are learning skills of programming at a rate almost equal to many of their instructors, they are unravelling the design of programs and are involved with solving sophisticated games. As a result of this exposure they will be in the vanguard of current learning and through the process will in all probability have developed an orderly and systematic approach to learning. One other vital factor of which we are constantly reminded is that our youth of today will be the adults of the twenty-first century and will share in the responsibility for creating our future. If we wish for well reasoned quality it will be important that we treat the growth of computer assisted instruction with care.

Today I have spent time presenting an overview to learning needs and styles as they relate to the possibilities for future assistance from the computer. One can see in this process the tremendous potential for the exploration and continued development of instructional alternatives and for the acquisition of knowledge, skills, values, and attitudes which will be applicable to both educational and working environments. One can also envision the formation of stronger collaborative working arrangements between education and industry in defining and seeking solutions to the host of problems associated with learning, the world of work, the problems of unemployment, and the problems our society will face in the coming years. It is certain that the computer will be a major presence in all of these deliberations.

One element I have not devoted time to is the very real need we have and will continue to have for the type of human instruction which cannot be given by a computer. The machine may ask questions and help us make choices, may help us to form values and develop skills, but it cannot be a substitute for the kind of authentic human interaction we so desperately need in our world. Philosophy provides us with questions we must continually ask ourselves and reflect upon as a prerequisite to these meaningful choices and decisions in our lives. In the final analysis though, the computer may provide the framework and the impetus, but it is still we as humans who must feel, reflect, think, and act.

COMPUTER ASSISTED LEARNING

- INDIVIDUALIZES LEARNING
- SELF-PACED
- STUDENTS DEVELOP SKILLS IN PROGRAMMING
- DIAGNOSTIC AND MONITORING CAPABILITIES
- PROVIDES IMMEDIATE FEEDBACK
- ACTIVE PARTICIPATION BY STUDENTS
- FACILITATION OF GROUP DISCUSSION
- MOTIVATOR OF LEARNING
- OUTCOME OF INCREASED CONFIDENCE

- ONLY A TOOL OR SUPPLEMENT
- TOO HIGHLY STRUCTURED
- WILL PRODUCE TECHNICIANS BUT NOT INNOVATORS
- ISOLATION FROM OTHER STUDENTS
- COMPUTER IS INHUMAN
- TOO MANY TECHNICAL SKILLS NEEDED

	Learning Style	Examples of Cognitive Skills	CAI Modes
Elementary Learning Needs (Conceptual Simplicity)	Dependence upon Authority	- Recall of information - Imitation - Discovery of correct answer - Simple calculation - Grasp of elementary ideas and patterns - Correct use of forms, i.e. reading and writing - Understanding symbols	- Tutorial - Drill & Practice - Problem Solving (elementary) - Gaming (elementary)
Complex Learning Needs (Conceptual Complexity)	Becoming Autonomous and Self-Directed	- Applying information to new situations - Predict (trends) - Analyze relationships - Synthesize elements into a new whole - Propose unique plan - Test hypotheses - Recognize unstated assumptions - Evaluate for accuracy and consistency	- Problem Solving (Complex) - Gaming (Complex) - Simulation - Inquiry - Dialogue